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How to Reduce Lead Exposures With One Simple Statute: The Experience of Proposition 65

Clifford Rechtschaffen
Golden Gate University School of Law, crechtschaffen@ggu.edu

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Editors' Summary: Human exposure to lead is one of the most serious environmental health threats today. Lead causes a variety of adverse health effects and is particularly harmful to children. Unfortunately, the current regulation of lead exposures is fragmented and often unsuccessful. California's Proposition 65, a right-to-know initiative, however, has achieved some noteworthy successes in reducing public exposures to lead. Proposition 65 has spurred faster and more significant lead reductions than federal law by prompting companies to reformulate products and change their manufacturing processes. This Article first discusses the hazards and uses of lead. The author next describes several instances that demonstrate how Proposition 65 has stimulated the development of new technologies and pollution prevention measures to reduce lead exposures. The author then examines why Proposition 65 has been more effective than comparable federal regulations. To conclude, the author notes that a simple, multi-media, self-executing statute like Proposition 65 can be more powerful than a host of complex regulatory programs in achieving actual reductions of pollutants in our environment.

Mr. Rechtschaffen is a Visiting Professor, University of California at Davis School of Law, and Professor, Golden Gate University School of Law. The author worked on implementing and enforcing Proposition 65 for the California Attorney General's office from 1986 to 1993. Vicki Clark, Caroline Farrell, Kristine Ogilvie, and Rebecca Sugerman provided valuable research assistance on this Article. Thanks to Richard Jacobs, Karen Kramer, Bob Percival, and Ed Weil for reviewing earlier drafts of the Article. Thanks also to Golden Gate University's Faculty Research and Development Fund for providing a research grant for this Article.

[29 ELR 10581]

Although the hazards of lead have been well known for centuries, human exposure to lead remains one of the most serious environmental health threats today. Lead causes a variety of adverse health effects, and has particularly devastating impacts on young children. Because lead has been used in a multitude of industrial processes, moreover, it enters the environment from a myriad of sources, and is ubiquitous in the human environment.

Since 1988, California's Proposition 65, a right-to-know initiative, has achieved some noteworthy successes in reducing public exposures to lead in media as diverse as calcium supplements, brass kitchen faucets, water well pumps, ceramicware, hair dyes, wine capsules, and factory emissions. These sources all were subject to regulation by the federal government, but Proposition 65 has spurred faster and more significant lead reductions than federal law by prompting companies to reformulate products and change their manufacturing processes. Proposition 65's effectiveness stems from several factors: it does not employ a one-at-a-time, product-by-product regulatory approach; it is self-executing and "enforcement friendly"; it imposes stringent, health-protective limits on lead exposure; and it relies in part on market incentives to change industry behavior. Thus, the success of Proposition 65, in particular its technology-forcing character, provides important lessons for the ongoing national debate about how best to reform environmental regulation.

This Article describes several instances that illuminate how Proposition 65 has stimulated the development of new technologies and pollution prevention measures to reduce lead exposures. It then examines why Proposition 65 has been more effective than comparable federal requirements in this area.

The Hazards and Uses of Lead

Lead is a well-known developmental and reproductive toxin. Lead poisoning is widely recognized as the most serious environmental health hazard facing young children today.[1] Children under age six are at greatest risk because their rapidly developing nervous systems are particularly vulnerable to lead, and because their absorption rates are **[29 ELR 10582]** high.[2] Pregnant women also are at risk because lead can pass from the woman to her fetus across the placenta.[3] Even at relatively low levels, lead poisoning can impair the development of a child's central nervous system, which can cause learning disabilities, decreased intelligence, impaired growth, hearing loss, limited attention span, and behavioral problems.[4] A recent study found that children exposed to higher levels of lead have more problems with tooth decay, with lead possibly responsible for as many as 11 percent of pediatric cavities.[5] The recognized level of lead toxicity for children has dropped dramatically over the past three decades, from blood lead levels of 60 micrograms per deciliter ([mu]g/dL) of whole blood in the mid-1960s to the current level, set by the Centers for Disease Control and Prevention in 1991, of 10 [mu]g/dL.[6] Nationwide, approximately 930,000 children between 1 and 5 have blood lead levels above 10 [mu]g/dL.[7]

Lead exposures also have significant health impacts for adults, including reproductive effects, increased risks of cancer, and high blood pressure.[8] In men, lead adversely affects spermatogenesis, while in women it adversely affects the ovarian and menstrual cycles. The reproductive effects of lead result from both short-term and long-term exposures. The U.S. Environmental Protection Agency (EPA) also has found lead to be a probable human carcinogen. Moreover, recent studies suggest that lead at unexpectedly low levels can cause increased blood pressure and kidney impairment. One of these studies found a closer link between hypertension and lead levels than with smoking, alcohol, or salt in the diet.[9] Higher levels of lead exposure cause a variety of severe health problems.

Lead, however, also has many technologically important and versatile properties. Not only is lead very malleable and easy to work with, but it is highly durable, insulates well, and resists corrosion. It is a constituent of many alloys, such as solder and brass. Lead-based paint weathers particularly well. As a result of these and other qualities, lead and lead compounds have long been used in innumerable products, including paint, water pipes and plumbing components, gasoline, car batteries, miniblinds, coverings for electric cables, ammunition, pesticides, inks in printed food wrappers, food cans, ceramicware, crystal, and many other consumer goods.[10] While lead has been phased out of gasoline, residential paint, and food cans, it is still used in a wide range of applications. In fact, lead consumption in the United States only decreased by approximately 8 percent from 1970 to 1990, even as these major uses of lead were restricted.[11]

Human exposure to lead thus results from a multitude of sources in a variety of media. Indeed, a diagram in a leading environmental law casebook illustrating the sources and environmental pathways that result in human exposures to lead resembles a hydra-headed monster.[12]

Proposition 65's Impact on Lead Exposures

Over the past 25 years, federal law has addressed several of the most important sources of lead exposure. EPA's phaseout of lead in gasoline that began in the late 1970s produced dramatic declines in the public's blood lead levels and, indeed, is frequently cited as one of the singular success stories of environmental law.[13] Likewise, voluntary industry efforts prompted by the Food and Drug Administration (FDA) led to a major reduction in the use of lead-soldered cans—first in infant food products and then on all canned foods—and a significant decline in the amount of lead in the average person's diet.[14] In addition, the Consumer Product Safety Commission banned lead-based paint for residential use in 1978.[15] As a result of these efforts, average blood lead levels in Americans have dropped sharply. In 1976, the average level of lead was 12.8 [mu]g/dL; it is now 2.3 [mu]g/dL.[16]

Federal law, however, has left significant gaps with respect to important sources of lead exposure. Despite the ban on lead-based paint, exposure to lead paint and dust in the estimated 57 million private housing units built in the United States before 1980 continues to be the major source of childhood lead exposure,[17] and the federal government has left the control of these lead-based paint hazards largely to the states. Federal regulation also has been slow to address exposures from lead in drinking water from faucets and other plumbing hardware, lead in ceramicware, and lead in calcium supplements, among other products. These sources also can contribute significant, unhealthy levels of lead to

the public. For example, in 1991, EPA found that lead in drinking water contributes 20 percent of total lead exposure for an average person, and possibly as much as 85 percent of lead for infants whose diets consist mainly of formula.[18] Researchers estimated that approximately 30 percent **[29 ELR 10583]** of this drinking water contamination was due to lead leaching from brass faucets.[19] Lead-glazed ceramicware is the largest source of lead in the diet.[20] In the early 1990s, the ceramicware industry itself estimated that ceramicware could be the source of up to one-quarter of the "acceptable" lead exposure for adults in this country.[21] Similarly, calcium supplements are widely used by the public to meet dietaryrequirements; over 50 percent of pregnant and lactating women regularly take calcium supplements. Until recently, almost all calcium supplements contained lead at levels of concern to public health officials.[22]

Although Proposition 65 has had little discernible impact on lead-based paint hazards, it has had a striking effect on some of these other important gaps left by federal law. Proposition 65 is an initiative overwhelmingly approved by the California voters in 1986.[23] The statute applies to a group of chemicals listed by the state of California as known carcinogens or reproductive toxicants.[24] Lead was listed by the state as a reproductive toxicant in 1987, and as a carcinogen in 1992.[25] In part, Proposition 65 prohibits a person in the course of doing business from "knowingly" discharging or releasing any listed chemical "into water or onto or into land where such chemical passes or will probably pass into any source of drinking water."[26] This provision extends broadly to releases to surface water or groundwater, to water currently drinkable or potentially drinkable, and even to tap water discharged from a kitchen or bathroom faucet.[27] The statute also imposes a far-reaching warning requirement: businesses must provide a "clear and reasonable" warning prior to "knowingly and intentionally" exposing any individual to a listed chemical. This includes consumer product exposures, occupational exposures, and environmental exposures.[28]

Proposition 65 only exempts exposures or discharges below a de minimis level, defined by the statute as exposures or discharges that pose "no significant risk" of cancer or that are below 1/1000th of the no observable effect level (NOEL) for reproductive toxicants.[29] The state has set a de minimis level for lead of 0.5 [mu]g/day.[30] The state also has taken the position, in litigation and other informal contexts, that because the adverse reproductive effects from lead can result from a single short-term exposure, averaging exposures over longer periods of time is inappropriate.[31] In practice, this means that the state considers any single exposure over the 0.5 [mu]g threshold a violation of the statute.

As shown below, Proposition 65 has caused substantial reductions in public exposures to lead by triggering fundamental shifts in long-standing means of production to avoid or minimize the use of lead. In the case of consumer goods, most companies have reformulated their products nationwide, giving Proposition 65 a national effect. The most noteworthy examples are as follows.

Lead in Brass Faucets, Submersible Well Pumps, and Water Meters

Historically, lead has been used in the plumbing/distribution system that conveys water to the public, including in lead pipes, lead solder used to join copper pipes in household plumbing, and in brass faucets, valves, and fittings. Lead adds malleability to the brass alloys used to produce faucets and other plumbing hardware, permitting brass to be milled to critical tolerances. It increases the machinability of alloys, which is important for creating threads on the faucets, by acting as a lubricant and a chip breaker. In cast alloys, lead helps deal with porosity caused by shrinkage during solidification. Lead also inhibits the corrosion of other metals in the alloy, increasing the durability of products.

With one very recent exception, federal law contains no limits on the amount of lead that persons can be exposed to from plumbing system components, including drinking water faucets, submersible pumps, or water meters. EPA has set a maximum contaminant level goal (MCLG) under the Safe Drinking Water Act (SDWA)[32] of zero for lead in drinking water,[33] but according to EPA, it is currently infeasible to reach this goal for lead. Therefore, EPA has set an "action level" for lead in drinking water of 15 parts per billion (ppb).[34] This standard is directed at public water systems: EPA requires these systems to monitor for lead at household taps, and if the action level is exceeded at more than 10 percent of the samples collected, the systems must **[29 ELR 10584]** provide notice to their customers and implement corrosion-control measures and, if appropriate, also carry out source water treatment and/or lead service line replacement.[35] In 1986, Congress amended the SDWA to limit plumbing solder to less than 0.2 percent lead and to restrict the use of lead in pipes and other plumbing components.[36] However, the statute contained a major loophole: with respect to faucets and other plumbing fixtures, it defined "lead-free" to be no more than 8 percent lead.[37] Thus, the best efforts of public drinking water systems can be completely undermined by lead leaching at the very last points of the distribution system.

[] *Faucets*. About 50 million brass drinking water faucets are sold in the United States each year.[38] Almost without exception, all brass faucets made with lead alloys, including those containing less than 8 percent lead, leach significant amounts of lead into tap water, many at levels far over Proposition 65's standard. Concentrations are highest when the faucets are new—in the first weeks some leach up to several hundred ppb of lead.[39] The concentrations gradually diminish over time, although a portion of older faucets—17 percent of faucets over 6 years old according to one survey of California homes—continue to leach significant amounts of lead.[40] The amount of lead that leaches into water depends on the lead content of the plumbing device, how much surface area in a faucet is exposed to water, how long the water resides in the faucet, the chemical properties of the water, and how the faucets are produced.[41]

In 1992, the California Attorney General's office along with two environmental organizations, the Environmental Law Foundation and the Natural Resources Defense Council (NRDC), sued 14 major faucet manufacturers for violating Proposition 65's warning and discharge provisions. Five years earlier, the plumbing industry had begun working with EPA and NSF International, an industry standard-setting organization, to develop a voluntary standard for lead leaching from faucets. The Proposition 65 litigation quickened what had been a protracted negotiation process, and NSF established a voluntary standard in 1994.[42] In 1995, the plumbing manufacturers settled the Proposition 65 suit, agreeing to manufacture faucets that are close to lead-free. Under the agreement, kitchen faucets must leach less than 5 [mu]g/l of lead, which is the level the state of California determined that the Proposition 65 exposure limits translates into when normalized to 1 liter. Bathroom and other faucets must meet the less stringent, voluntary NSF standard of 11 [mu]g/l of lead.[43] The companies have until the end of 1999 to bring 95 percent of their products into compliance.[44] (The voluntary NSF standard for faucets was made mandatory by the 1996 amendments to the SDWA.)[45]

The Proposition 65 litigation, as well as the new NSF standard, has prompted significant changes in how faucets are made.[46] Faucets are manufactured by three general methods, used alone or in combination: (1) fabrication, a technique in which extruded and drawn brass rod is machined into component parts, which are then welded together; (2) permanent mold casting (employed far less in the United States than in Europe), in which brass is poured into metal molds or dies; and (3) sand casting, in which brass is poured into sand molds. Sand casters use red brass alloys containing the highest amount of lead (between 4 and 8 percent). Some producers redesigned their faucets to reduce the internal volume of the faucets, which in turn reduces the amount of water in contact with the internal surface of the faucet and the amount of lead that will leach from the faucet. Others developed chemical rinses to apply to faucets that selectively remove surface lead.

Sand casters, whose faucets generated the highest lead exposures, were forced to make more fundamental alterations. Some companies changed certain product lines to fabrication or permanent mold casting. Sterling and Price Pfister, which in 1992 was the largest seller of faucets in California, shifted their entire production processes to fabrication. Plumbing manufacturers also developed alternative brass alloys that are lead-free or very low-lead. One such alloy was formulated by the American Foundrymen's Association and the Copper Development Association as a result of a collective research effort funded by the plumbing and copper industries. While this research had been underway prior to 1992, the Proposition 65 litigation unquestionably accelerated industry's search for lead-free alloys. The consortium-produced alloy, SeBiLoy, consists of selenium and bismuth, additions which replace all but trace amounts (0.25 percent maximum) of lead. SeBiLoy is now used by a number of sand casters, including one of the largest such companies, Chicago Faucet, in place of high-lead brass alloys. Other bismuth-modified cast red and yellow brass alloys have been developed by various companies.

Faucet manufacturers also devised a variety of relatively simple chemical treatments that "wash" or remove lead present on the inside surfaces of the metal surfaces exposed to water. These various treatments, including sodium acetate, aqueous solutions, and others, are cheap, easy to implement, and remarkably effective. One industry expert estimates that they are capable of removing up to 90 percent of **[29 ELR 10585]** the lead on the inside surface of the faucet without corroding the brass alloy in the faucet itself.[47] These techniques are now widely employed in the faucet industry.

[] *Submersible Well Pumps*. Approximately 13 percent of U.S. homes—about 12 million houses—get their water from private wells.[48] Most deep private wells use submersible pumps, which are installed inside the well and sit permanently under water, to pump the water out for household use. Most of these pumps are made with brass, in particular sand-cast brass. Approximately 450,000 new pumps are sold each year.[49] When the pumps are new, they leach concentrations of

lead at levels up to several hundred ppb—well over the federal action level and the Proposition 65 standard.[50] As with faucets, the problem diminishes over time, although a small portion of pumps continue to leach elevated lead levels for extended periods.[51] Pumps are regulated by the SDWA's general prohibition on lead content, but there are no limits on the amount of lead that can be leached from pumps into drinking water.

In April 1994, the California Attorney General and environmental groups sued four manufacturers of submersible pumps. At the time of the lawsuit, the best-selling pump in California—Grundfos—had already switched to using stainless steel rather than a leaded brass alloy. The Attorney General praised this company while suing its competitors.[52]

The Proposition 65 lawsuit galvanized EPA's attention, which reported that "to our knowledge, this is the first time anyone has looked at the problem. This finding is the first indication we've had that pumps might be a hazard."[53] EPA promptly issued an advisory announcing that lead contamination in private wells could be occurring from submersible pumps, and urging that all families with submersible pumps have their water tested.[54] The heightened regulatory attention also triggered industry fears about disclosing information about lead exposures caused by other plumbing fixtures. As a result, an industry task force on lead issues instructed its members that "it is important that data on lead leaching from water meters and related hardware, including data reported here, be kept within the industry to avoid the legislative spotlight and/or focused regulatory action by EPA."[55]

In late 1994, the state and environmental groups secured a settlement in which the four named companies agreed to sell pumps that are essentially lead-free (no more than 0.05 percent lead in any component or that leach no more than 1 ppb lead).[56] At the same time, the remaining U.S. pump manufacturers, prompted by the Proposition 65 litigation, ensuing publicity, and EPA's heightened attention, agreed to entirely phase out the use of leaded brass by the end of 1994.[57] Four companies already had done so, 1 earlier in the year, but the remaining 10 manufacturers were still using brass to make pumps. Instead of a leaded-brass alloy, most companies switched to using stainless steel.[58] Some also began making plastic pumps. That the companies were able to shift so rapidly strongly suggests that alternatives already had been developed, but that the industry needed outside pressure to make the change.

[] *Water Meters*. Water meters are installed by water districts to read the amount of water being used by consumers. All water traveling from a public or private distribution system to private residences passes through the meters. Almost all brass water meters are sand casted, using brass alloys containing between 4 and 7 percent lead. When new, these meters leach elevated concentrations of lead into drinking water far above federal and state limits, ranging up to several hundred ppb.[59] Significant leaching occurs even when water is stored in the meters only briefly (10 minutes or more), and small amounts of leaching continues for years.

As with pumps and faucets prior to 1996, federal law does not impose limits on lead discharges from meters. There is a voluntary industry standard adopted by NSF International for meters, but it has never been made mandatory by the SDWA.[60]

In 1997, environmental groups sued eight water meter manufacturers (close to the entire industry) for violating Proposition 65. In 1998, ABB Water Meters, one of the leading producers, agreed to sell only reformulated, non-leaded meters in California.[61] In place of leaded-brass alloys, ABB is now using SeBiLoy, the brass alloy that substitutes selenium and/or bismuth for lead.[62] Litigation against the other water meter companies is still ongoing. Given the outcome of related enforcement actions, however, it seems **[29 ELR 10586]** quite likely that the manufacturers will eventually consent or be ordered to lower lead exposures from their products.

Ceramicware

Ceramicware—in more common parlance, china—is a term encompassing plates, cups, mugs, bowls, pitchers, and other similar articles used to prepare, serve, and store food. Almost everyone uses glazed china. An estimated 1.2 billion pieces of ceramicware are sold annually in the United States.[63]

Lead often is used in the glazing materials for ceramicware for a number of reasons: lead glazes have a wide firing range; they have a low viscosity that allows lowtemperature firing; they create a certain gloss or brilliance because of their high-refractive index; they are durable; and they create smooth, nonporous, level surfaces that facilitate cleaning. Lead also is found in some pigments used to decorate ceramicware because it stabilizes decorating colors and allows for

a wide range of bright colors to be used.[64] Not all ceramicware is made with leaded glazes, however. Glass dishes have no glaze on them, and stoneware dishes normally do not have lead glazes either, unless they have painted decorations on the surface.

When food and drinks come into contact with lead in ceramicware, some lead leaches into the food and is consumed.[65] Ceramicware that has been fired improperly leaches much higher levels of lead. Lead leaching also increases when foods or liquids are hot or acidic, when they are microwaved, and when they are stored over time.

The FDA set informal guidelines for ceramicware in 1971, then established regulatory standards for lead leaching from various forms of ceramicware in 1979. In 1991, the FDA issued action levels for ceramicware—levels which do not have the force of regulation but may lead to some enforcement actions—that were significantly below the 1979 standards. The levels range from 3,000 ppb for plates and 500 ppb for cups and mugs.[66] The Proposition 65 limits, which the state determined translate into concentration limits of 226 ppb for plates and 100 ppb for cups, mugs, bowls and pitchers, are 5 to 20 times more stringent than the revised, nonbinding action levels.[67] In 1994, the FDA also adopted a regulation requiring that ornamental and decorative ceramicware be labeled to indicate that it is not for food use and that it may poison the food.[68]

In 1991, a major testing program by the Environmental Defense Fund (EDF) found lead leaching well over both federal and Proposition 65 standards across a broad spectrum of ceramicware types and prices.[69] Earlier data gathered by the industry likewise had shown elevated lead exposures from ceramicware, including exposures to women of childbearing age of up to 50 [mu]g/day.[70] In late 1991, the state of California and environmentalists sued 10 leading ceramicware manufacturers for violating Proposition 65.

At the time, some in the industry had been working on alternatives to leaded glazes and colors in response to the prospect of tighter federal regulation. Industry representatives claimed, however, that further reductions needed to comply with Proposition 65's standard were infeasible, and told a congressional subcommittee that "many ceramic tableware products could not be produced without the use of leaded glazes and/or colors."[71] One year later, the defendants in the case settled the lawsuit, agreeing over the next five years to a 50-percent reduction in lead leaching from plates and a 25-percent reduction from holloware for products over the Proposition 65 limit. For products that remain over the Proposition 65 level, warnings in the form of inverted yellow triangles outlined in black—resembling a traffic "yield" sign—have to be provided at retail outlets.[72] These distinctive warnings provided a powerful incentive to reduce lead leaching beyond the mandates of the agreement. The state and environmental groups brought subsequent actions against a few dozen additional manufacturers, and many companies who were never sued have elected to comply with the terms of the original settlement. The overall impact of the enforcement activities has been an impressive reduction in lead leaching from products throughout the industry. Before the Proposition 65 litigation, EDF's investigation showed that approximately 650 product lines complied with Proposition 65's standards. By 1998, over 8,000 product lines were in compliance.[73] One leading trade industry expert estimates that in very rough terms, 75 percent of the ceramic industry's patterns sold in the United States now meet Proposition 65's limits, as compared to 25 percent before the litigation commenced.[74]

The ceramic industryhas achieved these lead reductions in a number of ways.[75] Producers implemented a variety of quality control procedures because, as noted, poorly fired ceramicware leaches higher amounts of lead. These include **[29 ELR 10587]** reconfiguration of kilns and control mechanisms of kilns to ensure that temperature is truly uniform, replacement of kilns that had become saturated with lead from years of firing lead-based products, much stricter adherence to firing products at precise temperatures that yield the lowest lead release, injecting steam during the decoration process to harden the decoration, more rigorous and systematic testing, and stricter controls on raw materials. The industry, lead by the British Ceramic Research Ltd., a research laboratory, also developed alternative glazes, and virtually all major suppliers of glazes in the world now offer lead-free alternatives.[76] In some cases, the glazes are now made with a combination of boron and bismuth.[77] Bismuth and zinc also have been used to replace lead in fluxes used to adhere pigments onto glazes. Some companies also stopped decorating on the inside of cups. Developing and implementing these changes has been technically challenging and somewhat costly to the industry. But as with the plumbing industry, the ability of ceramic manufacturers to rapidly develop means of reducing lead exposures from their products demonstrates the powerful technology-forcing effect of Proposition 65.

Calcium Supplements

More than one-third of American households augment their diet with calcium, either using calcium supplements or antacids that contain calcium (collectively referred to as "supplements").[78] Calcium is essential for the proper maintenance and development of bones, and helps prevent osteoporosis. Calcium supplements are routinely recommended for pregnant and lactating women to ensure that they meet their dietary requirements of calcium. Moreover, recent medical evidence suggests that consuming sufficient calcium can reduce the risk of pregnancy-induced hypertension and preeclampsia.[79]

Unlike lead in plumbing fixtures or ceramicware, lead in calcium supplements is not a useful or desired ingredient, but is present because it is found in the raw materials used to produce supplements. Calcium is derived from several sources. The most important sources of calcium are ground oyster shells, geologic deposits of limestone or dolomite, and to a lesser extent at present, bone meal (calcium made from ground bones of horses and cows). Lead is found in these sources because of past human activity or because it occurs naturally in the environment.

Calcium supplements are regulated as a food by the FDA. The FDA, however, has never set limits on the lead content of calcium supplements. Its activities have been limited to dietary surveys, requests for information, and public advisories recommending that pregnant women and children avoid calcium supplements derived from bonemeal or dolomite.[80]

Most supplements have contained lead at levels exceeding the Proposition 65's standard. These levels declined in the early 1990s, but not enough to comply with Proposition 65. For instance, a 1996 investigation by the NRDC found that with a few exceptions, 26 brands of supplements and antacids tested had excessive lead levels, the highest resulting in exposures of 21 [mu]g/day.[81]

In 1997, environmental groups and the state of California sued 10 large producers of calcium supplements for violating Proposition 65.[82] The case quickly settled, with an agreement mandating considerable lead reductions. Producers agreed to immediately reduce lead levels in supplements to no more than 4 [mu]g per 1,000 milligrams of calcium (the recommended daily dose for most products), and to reduce the levels to 1.5 [mu]g per 1,000 milligrams of calcium by April 1999.[83] As with other products, the settlement has provided a benchmark for industry compliance, and other companies have reduced lead in their products to the levels mandated by the settlement.

Calcium producers have met the lower standard in several ways, including using better testing and quality control practices, and locating alternative, lower lead sources of calcium. For example, one of the largest suppliers of calcium, Specialty Minerals, Inc., spent a year and a half developing a test method with a lower detection limit for lead in calcium carbonate.[84] The company also engaged in a multi-year, worldwide search to find cleaner deposits of lime-stone. With the improved testing procedure and cleaner limestone deposits, and utilizing a chemical precipitation process in which mined calcium carbonate is chemically reduced to isolate the calcium and then re-crystallized to produce a "precipitated" calcium, Specialty Minerals has been able to reduce lead levels in calcium by 75 percent.[85] The additional cost to consumers of the reformulated calcium supplements is minimal, estimated by one industry expert to be around $ 1.00 a year for a person taking daily supplements.[86]

Lead Foil Capsules on Wine Bottles

Historically, lead was added to wine as a sweetener, and some wines may have contained as much as 20,000 to 30,000 [mu]g/l of lead.[87] That practice has long since been **[29 ELR 10588]** abandoned, but for many years winemakers added lead to their products by using tin-lead foil capsules that range from 95 to 97 percent lead. The tin-lead foil capsule consisted of lead sandwiched between thin layers of tin foil, which was placed over the cork and neck of the bottle. The capsules were used to prevent insect infestation, as a barrier to oxygen, and for decorative purposes. Lead from the capsule was deposited onto the lip of the bottle where it passed into the wine when it was poured; some lead also leached into the wine when the capsules were in place.[88]

Tests conducted in the late 1980s and in 1991 by the British Ministry of Agriculture and the Bureau of Alcohol, Tobacco, and Firearms (BATF) found that hundreds of wines contained significant levels of lead due to contamination from the capsules, ranging up to several hundred [mu]g/L at the upper end. This was in addition to the significant levels of lead found in the body of the wine (in situ) that resulted from sources other than the capsule, such as lead-contaminated soil.[89] No federal standard, however, limited the content of lead in wine. The FDA, in consultation

with the BATF, began evaluating the health effects of lead in wine in 1987. Four years later, it informed the BATF that it would support actions to remove wines containing lead at levels greater than 300 [mu]g/dL.[90] The FDA proposed prohibiting the use of tin-coated lead foil capsules on wine bottles in 1992, and eventually did so four years later.[91]

Five years earlier, in 1991, the California Attorney General sued 13 winemakers for violating Proposition 65. At that point, winemakers had already begun shifting to non-leaded capsules because several states had prohibited the use of lead and other metals in packaging materials, including wine bottles. This move was largely because of concerns about the disposal of metals in landfills rather than worries about consumer product exposures.[92] The Proposition 65 litigation quickly settled, with the defendants agreeing rapidly to phase out their use of lead-foil caps by the end of 1991. Eventually over 300 companies opted-in to the settlement, agreeing to be bound by its terms, and most of the wine industry followed suit.[93]

In place of leaded wrappers, winemakers now use several alternatives: plastic, heat-shrunk wrappers, and wrappers made with aluminum and tin.[94] Some now package wine bottles with a flanged top, which eliminates the need for any capsule at all.

Crystal Decanters and Glasses

Lead crystal is a form of glass that was invented several hundred years ago. Lead adds brillance and clarity to the glass, and makes it strong and resonant. Crystal decanters and glasses often are composed of 20 to 33 percent lead.[95]

Lead leaches into beverages stored in leaded-crystal glass at remarkably high concentrations. The longer the storage time, and the more acidic the beverage, the greater the leaching that will occur. One study showed that wine stored in decanters over four months contained 3,500 [mu]g/dL of lead, and that wines and spirits stored for several years had concentrations as high as 21,000 [mu]g/dL of lead.[96] Storing beverages for much shorter periods of time, even a matter of minutes, can also lead to elevated lead exposures.

There are no specific federal standards addressing the content of lead in decanters and stemware or the permissible exposure levels to consumers using such products. In 1991, the FDA issued an advisory on the long-term storage of alcoholic beverages in leaded crystalware and the use of these products by pregnant women and children.[97] Beginning in 1991, several private parties and the Attorney General's office sued a number of manufacturers of crystal decanters and glasses.

In contrast to many other consumer products subject to Proposition 65 enforcement, the crystal products were not reformulated in response to litigation. Rather, companies agreed to post signs in retail stores warning consumers about lead exposures from using leaded crystal.[98] One notable exception was Baccarat, which developed a technology to line the inside of the leaded crystal with a thin layer of unleaded glass that prevents the lead from leaching into liquids being stored in the decanters. Interestingly, anecdotal evidence suggests that the company had developed this technique at least two years earlier, but only incorporated it into its product in response to the Proposition 65 litigation.[99] Waterford Wedgwood also stopped selling crystal baby bottles.[100]

Air Emissions

Lead is a criteria air pollutant under the Clean Air Act (CAA),[101] for which EPA has set a national ambient air quality standard (NAAQS) of 1.5 [mu]g per cubic meter.[102] The CAA does not, however, impose any specific limits on lead emissions from existing industrial sources, largely leaving it up to the states to determine how to achieve NAAQS. In 1988, over 985,000 pounds of lead were emitted nationally from facilities subject to the reporting requirements of EPCRA. In California, the figure was 74,313 pounds.[103] **[29 ELR 10589]** Moreover, there are many lead-emitting facilities in compliance with the CAA whose emissions nonetheless generate significant, localized risks. This was highlighted by a local environmental group's aggressive investigation of California lead emitters in the mid-1990s, which uncovered facilities that were emitting up to several thousand pounds of lead each year and exposing thousands of persons to elevated levels of lead.[104] For example, a brass and iron foundry in East Oakland was exposing adjacent residents to several hundred [mu]g/day of lead, and close to 200,000 residents to lead levels over the Proposition 65 limit of 0.5 [mu]g/day.[105] A lead smelting facility in Anaheim was exposing over 9,000 local workers and residents to more than 5.0 [mu]g/day, and close to 200,000 workers and residents to lead levels greater than 0.5 [mu]g/day.[106]

As a result of this investigation, environmental groups and public prosecutors filed a series of Proposition 65 actions against lead battery manufacturers, recyclers, lead smelters, glass container recyclers and producers, and other lead emitters. Most of these cases settled, on terms providing that the facilities radically reduce their lead emissions. Facilities agreed to a range of pollution control measures, such as installing new or upgraded baghouse systems; sealing leaking valves; installing an "air knife" system to remove lead from aluminum cans prior to recycling; and more frequently inspecting their equipment.[107] One of the principal attorneys bringing these enforcement actions estimates that collectively the agreements have prompted a reduction of thousands of pounds of lead emissions.[108]

Beyond these direct enforcement actions, Proposition 65 also appears to have triggered other dramatic cuts in air emissions of lead. Between 1988 and 1996, air emissions of lead in California declined by an extraordinary 99 percent, to 751 pounds annually.[109] This decrease is far greater than the 42-percent drop in lead emissions to 575,721 pounds annually, which occurred in the rest of the United States during the same period.[110] That this difference likely is attributable in substantial measure to Proposition 65 is supported by a recent EDF analysis showing that air emissions of about 150 chemicals subject to both Proposition 65 and the Emergency Planning and Community Right-To-Know Act declined more sharply in California than the rest of the country from 1988 to 1995.[111] At the same time, there was almost no difference in the rates of decline for chemicals subject to federal law but not Proposition 65.[112]

Miscellaneous

Proposition 65 has been used to address a host of other, varied sources of lead exposures. For example, some residential water filters—promoted to consumers as removing contaminants, including lead, from drinking water—contain components with leaded-brass alloys.[113] An investigation by the San Francisco-based Center for Environmental Health found that a number of these filters actually added significant amounts of lead to drinking water.[114] The potential exposures to consumers from the filters were as high as 35 [mu]g/day of lead.[115] After litigation was filed, most companies in the industry agreed to sell filters with only lead-free materials. The manufacturers have replaced brass components with stainless steel or plastic.[116] Likewise, three major producers of brass check valves—brass fittings used inside drinking water wells to prevent water from running back-wards into the well after it has been pumped up—consented to reformulate their products and use only nonleaded brass alloys.[117] As a result of an enforcement action filed under Proposition 65,the producer of a major hair dye cut the lead content of its product in half.[118] Due to another settlement agreement, the major manufacturers of home lead casting equipment—sold to hobbyists who cast lead at home to make things like lead sinkers, toy soldiers, and bullets—agreed to warn consumers about the risks of lead emissions and lead dust from their products.[119] Another recent settlement requires that the manufacturers of the antacid Maalox, which contains lead in the magnesium hydroxide present in the product, either reduce lead levels or provide warnings to consumers.[120] Sixty-day notices also have been filed recently in connection with exposures to lead in brass keys, diving weights, and zinc oxides used to treat skin irritations, including diaper rash.

Some Limitations: Exposures to Lead-Based Paint

In one highly significant area—exposures from lead-based paint—Proposition 65 has been ineffective. There only have been two reported enforcement cases involving lead-based paint. In both of these cases—one involving a huge housing complex in east Los Angeles, the other involving married student housing at Stanford University—the property owners agreed to conduct lead hazard control activities and conduct blood lead testing for children.[121] Several factors **[29 ELR 10590]** explain the paucity of enforcement actions and the statute's marginal impact with respect to lead-based paint. First, the problem is both diffuse and retrospective, requiring cleanup of lead contamination in thousands of homes.[122] Second, Proposition 65 only applies to businesses with 10 or more employees, thus excluding many property owners.[123] Third, government agencies do not routinely test housing for lead-based paint, so many tenants are unaware that they are being exposed to lead. Finally, at least since the end of 1996, property owners have been required by federal law to notify tenants of any lead-based paint hazards prior to renting housing units built before 1978.[124] Property owners who comply with this requirement are unlikely to be sued for noncompliance withProposition 65, even though the federal notice is not exactly the same as the "clear and reasonable" warning mandated by Proposition 65.[125]

The Different Approaches of Federal Law and Proposition 65

Why has Proposition 65 been more effective than federal law in addressing certain lead hazards from drinking water,

consumer products, and other sources? Several characteristics about the statute explain its relative success compared to federal law.

First, despite periodic calls for such a strategy, there has never been a coordinated federal approach to controlling lead hazards. Rather, lead exposures have been regulated by an array of agencies acting under a multitude of regulatory authorities. Thus, to cite a few examples, EPA regulates lead discharges and lead exposures under the CAA, the Federal Water Pollution Control Act,[126] the SDWA, the Toxic Substances Control Act (TSCA),[127] and the Resource Conservation and Recovery Act.[128] The Federal Food, Drug, and Cosmetic Act (FFDCA)[129] regulates exposures to lead from food, drugs, and cosmetics, including products such as ceramicware, calcium supplements, and lead-soldered cans. Worker exposure standards for lead are set by the Occupational Safety and Health Administration (OSHA). Leadbased paint has been regulated by the Department of Housing and Urban Development under a series of statutes primarily directed at federally assisted housing units. Not surprisingly, these diverse regulatory authorities contain differing directives for the regulation of lead. Some statutes are purely health-based (such as the old section 112 of the CAA); others require a balancing of the cost of controls against their benefits to human health and the environment (TSCA); and others require agencies to protect health as stringently as feasible given current technology (the SDWA, Occupational Safety and Health Act).[130]

EPA does have authority under TSCA, which authorizes regulation of the manufacture or use of any chemical substance that presents an unreasonable risk of injury to health or the environment,[131] to address lead hazards more comprehensively, and at some points in the past has considered doing so.[132] However, TSCA also imposes formidable burdens on EPA before it can act. For example, EPA must make findings about the benefits of the substance, the availability of substitutes for it, and the reasonably ascertainable economic consequences of regulation, and then choose the least burdensome regulatory alternative.[133] EPA understandably has been gun-shy to proceed under TSCA after its regulation banning asbestos in almost all products—developed after a 10-year, 45,000-page rulemaking process—was overturned by the Fifth Circuit Court of Appeals.[134]

In contrast to the fragmented approach of federal law, Proposition 65 covers a very broad range of activities and environmental media with a single law. The warning requirement applies without limitation to any exposure to a listed chemical, encompassing everything from kitchen faucets, ceramicware, water coolers, food and wine, lead-based paint, miniblinds, crystal decanters, water filters, hair dyes, bullets, and galvanized nails to factory emissions and workplace exposures. The discharge provision proscribes discharges to a "source of drinking water," but this applies broadly to surface water, groundwater, and tap water, and includes direct releases to water bodies or indirect releases onto land likely to migrate to sources of drinking water.[135]

Second, unlike federal law, Proposition 65 is self-executing. Once a chemical is listed by the state as causing cancer or reproductive harm and the relevant statutory grace periods expire, Proposition 65's provisions take effect without specific administrative standards that specify acceptable levels of exposure. This contrasts with federal statutes, where private activity causing lead exposures is permitted *until and unless* the government sets a restrictive standard.[136] Proposition 65 also is more "enforcement-friendly" than federal provisions. The statute can be enforced by public prosecutors or citizen groups acting in the public interest.[137] There are extremely limited defenses available under the statute; the most important is that an exposure or discharge **[29 ELR 10591]** is below the de minimis level. Moreover, in an enforcement action, the defendant bears the burden of proving this.[138] Violations of the statute result in penalties of up to $ 25,000 per day per violation, and 25 percent of the penalties go to the plaintiff initiating the enforcement action.[139] Thus, enforcement actions are relatively easy to bring, face few defenses, and can result in enormous penalties—creating considerable incentives for groups outside of the government to search for violations. Moreover, both the California Attorney General's office and many environmental groups and private parties bringing cases have been willing to forego civil fines on defendant companies in exchange for product reformulations.[140] Faced with the prospect of large penalties, many companies have consented to reformulate their products in order to reduce their potential liability; other manufacturers have done so to avoid the possibility of a lawsuit entirely.[141] As a result, enforcement actions have prompted many product reformulations over the past 10 years.

Third, the Proposition 65 de minimis lead standard of 0.5 [mu]g is stricter than federal requirements. The state health and welfare agency derived this standard by using OSHA's permissible exposure limit for daily exposure to airborne lead of 500 [mu]g/day as the NOEL for lead.[142] The use of this OSHA standard as the NOEL, as well as the conservative requirement in Proposition 65 of a thousand-fold safety factor for reproductive toxicants such as lead, has

been heavily criticized by industry. This standard was never challenged, however, almost certainly because given the emergent consensus that there is no safe level of exposure to lead, the standard is scientifically justifiable.[143]

Federal regulatory standards for lead exposure vary depending on the context, but no enforceable federal limits are as stringent as the state standard. As noted,EPA has set an MCLG of zero for lead in drinking water, but this is a nonenforceable health goal.[144] In some cases, the federal government has set specific limits that exceed the Proposition 65 levels, such as action levels set by the FDA for ceramicware.[145] In other contexts, such as calcium supplements, leaded crystal, and other products, there are no specifically enforceable limits on human exposure to lead.

Finally, Proposition 65 differs from most federal requirements by primarily relying on information disclosure to prompt lead reductions. This approach has been especially effective in the consumer marketplace. Because consumer demand can be extremely sensitive to disclosure of adverse health and safety information, particularly with respect to food products, many businesses have elected to reformulate their products rather than provide warnings and risk significant sales losses.[146] By contrast, federal regulation largely relies on traditional, direct regulatory approaches, such as setting lead limits in a particular product.[147] While more prescriptive, these federal requirements trigger far less consumer demand for product changes than information disclosure mandates.

Conclusion

Proposition 65 has been able to quickly and efficiently fill in important gaps in the regulation of lead exposures left by federal law. In 10 short years, the statute's stringent lead limits have forced the development of new technology and substantially reduced pollution across a wide range of media and products. In the plumbing industry, Proposition 65 accelerated the search for new brass alloys, new production methods, and better manufacturing processes. Proposition 65 also prompted the ceramic industry to develop new lead-free glazes and improve its firing techniques, and calcium suppliers to find cleaner sources of calcium deposits. These and other experiences over the past decade illustrate that a simple, multimedia, self-executing statute like Proposition 65 can be more powerful than a host of complex regulatory programs in achieving actual reductions of pollutants in our environment.

1. According to the Centers for Disease Control and Prevention, "lead poisoning remains the most common and societally devastating environmental disease of young children." CENTERS FOR DISEASE CONTROL AND PREVENTION, U.S. DEP'T OF HEALTH AND HUMAN SERVICES, STRATEGIC PLAN FOR THE ELIMINATION OF CHILDHOOD LEAD POISONING xi (1991) [hereinafter STRATEGIC PLAN].

2. *See* KAREN L. FLORINI ET AL., ENVIRONMENTAL DEFENSE FUND, LEGACY OF LEAD: AMERICA'S CONTINUING EPIDEMIC OF CHILDHOOD LEAD POISONING 1-2 (1990) [hereinafter LEGACY OF LEAD].

3. *See id.* at 24.

4. *See* STRATEGIC PLAN, *supra* note 1, at 9; *see also* LEGACY OF LEAD, *supra* note 2, at 6-9.

5. *See* John O'Neill, *Study Finds Lead Poisoning Is Tied to Children's Tooth Decay*, N.Y. TIMES, June 23, 1999, at A15.

6. *See* CENTERS FOR DISEASE CONTROL AND PREVENTION, U.S. DEP'T OF HEALTH AND HUMAN SERVICES, PREVENTING LEAD POISONING IN YOUNG CHILDREN: A STATEMENT BY THE CENTERS FOR DISEASE CONTROL 1-2, 7-8 (1991). There is no level of lead exposure that is considered safe, and some public health experts believe that exposure presents a "continuum of toxicity." *See id.* at 2; *see also* LEGACY OF LEAD, *supra* note 2, at 11-13.

7. *See* Centers for Disease Control and Prevention, *Update: Blood Lead Levels—United States, 1991-1994*, 46 MORBIDITY & MORTALITY WKLY. REP. 142 (Feb. 21, 1997).

8. *See* LEGACY OF LEAD, *supra* note 2, at 9-10, 25.

9. *See* Denise Grady, *Unexpected Dangers Found in Low Levels of Lead*, N.Y. TIMES, Apr. 17, 1996, at Cl.

10. *See* LEGACY OF LEAD, *supra* note 2, at 15-21.

11. *See Bad Decisions Again and Again*, RACHEL'S ENV'T & HEALTH WKLY., No. 541 (Apr. 10, 1997) http://www.rachel.org/bulletin/index.cfm.

12. *See* ROBERT V. PERCTVAL ET AL., ENVIRONMENTAL REGULATION 181 (1st ed. 1992).

13. *See* ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION 489-91, 566-67 (2d ed. 1996).

14. The FDA prohibited the use of lead-soldered cans in 1995. *See* Lead Solders, 21 C.F.R. § 189.240 (1998). From 1982 to 1991, the levels of lead in the food supply declined by 90 percent. *See Lead in Ceramicware and Crystal: An Avoidable Risk: Hearings Before the Ad Hoc Subcomm. on Consumer and Envtl. Affairs of the Senate Comm. on Governmental Affairs*, 102d Cong. 41 (1992) (statement of Michael Taylor, Deputy Commissioner, FDA) [hereinafter Taylor statement].

15. *See* Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint, 16 C.F.R. §§ 1303.1-.5 (1998) (banning use of paints with greater than .06 percent lead by weight).

16. *See* Centers for Disease Control and Prevention, *supra* note 7, at 142.

17. *See* STRATEGIC PLAN, *supra* note 1, at 18.

18. *See* National Primary Drinking Water Regulations for Lead and Copper, attachment, 56 Fed. Reg. 26470 (1991).

19. *See* RICHARD P. MAAS ET AL., UNC-ASHEVILLE ENVIRONMENTAL QUALITY INSTITUTE, TECHNICAL REPORT 92-007, STANDARDIZED LEAD LEACHING CHARACTERISTICS OF TWENTY-ONE MODELS OF NEW FAUCET FIXTURES AND INSTANT HOT WATER DISPENSERS 2 (Oct. 1992).

20. *See* Taylor statement, *supra* note 14, at 42.

21. *Lead in Ceramicware and Crystal: An Avoidable Risk: Hearings Before the Ad Hoc Subcomm. on Consumer and Envtl. Affairs of the Senate Comm. on Governmental Affairs*, 102d Cong. 96 (1992) (statement of Dr. Steven Book, Interim Director, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency) [hereinafter Book statement].

22. *See infra* notes 78-86 and accompanying text.

23. When the initiative was being considered by the voters, opponents predicted that it would have dire economic impacts, including shutting down the state's agricultural industry. *See* ARGUMENT AGAINST PROPOSITION 65, CALIFORNIA BALLOT PAMPHLET, GENERAL ELECTION 5x (Nov. 4, 1986); BRUCE H. JENNINGS, SENATE OFFICE OF RESEARCH, REPORT TO THE STATE SENATE OF 1990, CALIFORNIA'S EXPERIENCE WITH PROPOSITION 65: IMPLEMENTING THE SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT, NO. 498-S, at 27 (1990).

24. *See* CAL. HEALTH & SAFETY CODE § 25249.6 (West 1992 & Supp. 1999).

25. *See* CAL. CODE REGS. tit. 22, § 22-12000 (1995).

26. *See* CAL. HEALTH & SAFETY CODE § 25249.

27. *See* People v. American Standard, 14 Cal. 4th 294 (1996).

28. *See* CAL. CODE REGS. tit. 22, § 22-12601.

29. *See* CAL. HEALTH & SAFETY CODE § 25249.10. There also are grace periods after which a chemical is listed during when the statute's requirements do not apply—20 months for the discharge provision, and 12 months for the warning provision. *See id.* §§ 25249.9(a), 25249.10(b).

30. *See* CAL. CODE REGS. tit. 22, § 22-12805(a). This level is not absolutely binding; regulated entities can develop

their own de minimis standard, provided they use methods of equal scientific validity. *See id.* § 22-12801(a) (1993).

31. *See, e.g.*, Memorandum of Points and Authorities in Support of Motion for Preliminary Injunction, and Declaration of James Donald in Support of Motion for Preliminary Injunction at 6, People v. Baccarat (S.F. County Super. Ct. filed Sept. 13, 1991) (No. 932292).

32. *See* 42 U.S.C. §§ 300f to 300j-26, ELR STAT. SDWA §§ 1401-1465.

33. *See* Maximum Contaminant Level Goals for Inorganic Contaminants, 40 C.F.R. § 141.51(b) (1998). An MCLG is "the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. [MCLGs] are nonenforceable health goals." Definitions, *id.* § 141.2.

34. *See* General Requirements, *id.* § 141.80(c)(1).

35. *See* Control of Lead and Copper, *id.* §§ 141.81-141.82; 141.85.

36. *See* 42 U.S.C. § 300g-6, ELR STAT. SDWA § 1417.

37. *See id.* § 300g-6(d)(2), ELR STAT. SDWA § 1417(d)(2).

38. *See* NATURAL RESOURCES DEFENSE COUNCIL, LEAD FAUCETS & TECHNOLOGY I (1991).

39. *See* RICHARD P. MAAS ET AL., *supra* note 19, at 4, 9-14; *see also* RICHARD P. MAAS ET AL., UNC-ASHEVILLE ENVIRONMENTAL QUALITY INSTITUTE, TECHNICAL REPORT 93-009, THE RATE AND EXTENT OF LEAD LEACHING FROM FAUCET FIXTURES AND HOT WATER DISPENSERS UNDER LABORATORY CONDITIONS 2, 5-16 (Sept. 1993).

40. *See* RICHARD P. MAAS ET AL., UNC-ASHEVILLE ENVIRONMENTAL QUALITY INSTITUTE, LEAD LEACHING FROM BRASS WATER METERS UNDER PRESSURIZED FLOW CONDITIONS, Paper Presented at American Water Works Association Annual Conference (July 17, 1997).

41. Faucets that are sand-cast leach significantly more lead because the process draws lead to the interior surfaces, resulting in rough, leadrich inner surfaces.

42. *See* NSF INTERNATIONAL, STANDARD 61, SECTION 9: DRINKING WATER SYSTEM COMPONENTS-HEALTH EFFECTS (1994).

43. *See* Consent Judgment as to Defendants American Standard, Inc., Elkay Mfg. Co., Masco Corp. of Indiana, Moen Inc., Universal-Rundle Corp; Eljer Mfg., Inc.; U.S. Brass Corp., People of the State of California v. American Standard, Inc. et al. (S.F. County Super. Ct. filed Oct. 5, 1995) (No. 948017).

44. *See id.*

45. *See* 42 U.S.C. § 300g-6(e), ELR STAT. SDWA § 1417(e); Interpretation of New Drinking Water Requirements Relating to Lead Free Plumbing Fittings and Fixtures, 62 Fed. Reg. 44864 (1997).

46. *See* Telephone Interview with Dale Peters. Vice President, Industrial and Environmental Services, Copper Development Association (Nov. 28, 1998).

47. *See id.*

48. *See* Frank Clifford, *State Acts to Cut Use of Brass in Well Pumps*, L.A. TIMES, Apr. 19, 1994, at A3.

49. *See* ENVIRONMENTAL DEFENSE FUND, MANY PUMPS IN PRIVATE WELLS POSE LEAD THREAT; ENVIRONMENTAL GROUPS, CALIFORNIA ATTORNEY GENERAL FILE SUIT (Apr. 18, 1994).

50. *See* RICHARD P. MAAS ET AL., UNC-ASHEVILLE ENVIRONMENTAL QUALITY INSTITUTE,

TECHNICAL REPORT 94-003, INITIAL LEAD LEACHING CHARACTERISTICS OF SUBMERSIBLE PUMPS USE IN RESIDENTIAL WELL 6-14 (1994).

51. *See* RICHARD P. MAAS ET AL., UNC-ASHEVILLE ENVIRONMENTAL QUALITY INSTITUTE, TECHNICAL REPORT 94-012, CHARACTERISTICS OF LEAD LEACHING: A LONGITUDINAL FOLLOW-UP STUDY OF SUBMERSIBLE WELL PUMPS UNDER FIELD CONDITIONS 7-10 (1994).

52. *See* Reynolds Holding, *Pumpmakers Sued Over Lead in Well Water*, S.F. CHRON., Apr. 19, 1994, at A1.

53. Clifford, *supra* note 48.

54. *See id.*

55. Meeting Report. Copper Development Lead Removal Task Force 2 (Sept. 1, 1994) (on file with author).

56. *See* STATE OF CALIFORNIA, DEP'T OF JUSTICE, OFFICE OF THE ATTORNEY GENERAL, PROPOSITION 65 LITIGATION (May 1, 1996) [hereinafter PROP. 65 LITIGATION] (unofficial summary compiled and updated by the Attorney General's office).

57. *See* Letter from Robin W. Grover, Keck, Mahin & Cate, to Peter L. Cook, Deputy Director, EPA Office of Ground Water and Drinking Water 2 (Aug. 23, 1994) (on file with author).

58. *See* Telephone Interview with George Strally, Customer Service Representative, Goulds Pumps (Aug. 11,1998); *see also* Telephone Interview with Marvin Whitson, Technical Support Group Leader, Sta-Rite Industries, Inc. (Dec. 23, 1998).

59. *See* RICHARD P. MAAS ET AL., UNC-ASHEVILLE ENVIRONMENTAL QUALITY INSTITUTE, TECHNICAL REPORT 94-002, THE EFFECTS OF ACIDITY, PRE-CLEANING AND SURFACE COATING ON LEAD LEACHING FROM STANDARD LEADED-BRASS WATER METERS 6-14 (1994).

60. *See* 42 U.S.C. § 300g-6(d)(3), ELR STAT. SDWA § 1417(d)(3), (e); *see also* U.S. EPA, SECTION 1417 OF THE SAFE DRINKING WATER ACT AND THE NSF STANDARD COMMONLY ASKED QUESTIONS (undated document, on file with author). A number of states, however, have adopted the NSF standard as part of their plumbing codes.

61. *See* Frank Clifford, *Maker Will Phase Out Water Meters With Lead*, L.A. TIMES, Dec. 9, 1998, at B3.

62. *See* Interview with James Wheaton, President, Environmental Law Foundation, in Oakland, Cal. (Nov. 13, 1998). The Environmental Law Foundation is the lead plaintiff in the enforcement action against the water meter companies.

63. *See Lead in Ceramicware and Crystal: An Avoidable Risk: Hearings Before the Ad Hoc Subcomm. on Consumer and Envtl. Affairs of the Senate Comm. on Governmental Affairs* 102d Cong. 137 (1992) (statement of David Roe, Senior Attorney, Environmental Defense Fund) [hereinafter Roe statement].

64. *See Lead in Ceramicware and Crystal: An Avoidable Risk: Hearings Before the Ad Hoc Subcomm. on Consumer and Envtl. Affairs of the Senate Comm. on Governmental Affairs*, 102d Cong. 219 (1992) (statement of David Hartquist, Executive Director, Coalition for Safe Ceramicware) [hereinafter Hartquist statement].

65. *See Lead in Ceramicware and Crystal: An Avoidable Risk: Hearings Before the Ad Hoc Subcomm. on Consumer and Envtl. Affairs of the Senate Comm. on Governmental Affairs*, 102d Cong. 2 (1992) (opening statement of Sen. Joseph I. Lieberman).

66. *See* Lead in Ceramic Foodware; Revised Compliance Guide, 57 Fed. Reg. 29734 (1992). The agency had proposed in 1989 to adopt a regulatory standard for pitchers that was 10 times lower than the 1991 action levels, but withdrew this proposal. Standards for cups and mugs are stricter than standards for plates because they are used to consume hot acidic drinks. Standards for holloware items—such as bowls and pitchers—are stricter because they can be used for long-term storage of foods.

67. These levels were determined using a standardized lead extraction test and a representative California diet. *See* Book statement, *supra* note 21. One hundred ppb is what the state determined to be the level of detection for lead in ceramicware, and thus the lowest enforceable standard. For some types of ceramicware, the concentration limits that the state determined met Proposition 65's exposure standards were lower, ranging from 6 ppb to 23 ppb (the lowest is for large holloware used for storage and cooking). *See id.* at 105.

68. *See* Requirements for Decorative Ceramicware to Be Deemed Not for Food Use, 59 Fed. Reg. 1638 (1994).

69. *See* Roe statement, *supra* note 63, at 140.

70. *See id.* at 168.

71. *See* Hartquist statement, *supra* note 64, at 220.

72. *See* PROP. 65 LITIGATION, *supra* note 56, at 11.

73. *See* Environmental Defense Fund, Examples of Consumer Product Responses to Proposition 65 (1997) (unpublished memo, on file with author).

74. *See* Telephone Interview with Kevin Ferell, Executive Director, British Ceramic Federation (Dec. 15, 1998).

75. *See id.*

76. *See* Letter from Sandra Spence, Executive Director, Society of Glass and Ceramic Decorators, to author (Nov. 12, 1998) (on file with author).

77. *See* Philip Jackson, *Solutions to Lead Glazes Are Brought to the Table; Tableware*, 147 CERAMIC INDUSTRY 76 (Apr. 1997).

78. *See* ROBERT S. LAZICH, MARKET SHARE REPORTER 144 (1996).

79. *See* Heiner C. Bucher et al., *Effect of Calcium Supplementation on Pregnancy-Induced Hypertension and Preeclampsia: A Meta-analysis of Randomized Controlled Trials*, 275 JAMA 1113 (1996).

80. *See* P. Michael Bolger et al., *Identification and Reduction of Sources of Dietary Lead in the United States*, 13 FOOD ADDITIVES & CONTAMINANTS 53, 59 (1996). *See also* Marion Burros, *Eating Well*, N.Y. TIMES, June 4, 1997, at A2.

81. *See* Burros, *supra* note 80, at A2 (citing testing conducted by A. Russell Flegal, Ph.D., at the University of California-Santa Cruz Department of Environmental Toxicology).

82. At the same time, environmental groups announced that the largest calcium supplement manufacturer in the country, Leiner Health Group, had reformulated its products to comply with Proposition 65. *See* Jane Kay, *Drug Maker to Drop Lead in Calcium*, S.F. EXAMINER, Jan. 28, 1997, at A5.

83. *See* Stipulation for Entry of Consent Judgment and for Payment of Settlement Amount and Order Thereon, People of the State of California v. Warner-Lambert Co. et al. (S.F. County Super. Ct. filed June 20, 1997) (No. 984503). The state determined that 1 [mu]g of lead was naturally occurring and could not be feasibly removed by quality control measures; under Proposition 65's implementing regulations, warnings are not required for "naturally occurring chemicals in food." 22 CAL. CODE REGS. tit. 22, § 22-2501(a) (1996).

84. *See* Telephone Interview with Judy Hahn, Marketing Manager, Specialty Minerals, Inc. (Mar. 26, 1999).

85. *See id; see also Specialty Minerals Debuts PCC With Ultra-Low Lead*, INDUSTRIAL SPECIALTIES NEWS, Feb. 24, 1997, *available in* LEXIS, Market Library, IACNWS file.

86. *See* Telephone Interview with Judy Hahn, *supra* note 84.

87. *See* Joseph Graziano & Conrad Blum, *Lead Exposure From Lead Crystal*. 337 THE LANCET 141 (Jan. 19, 1991).

88. *See* Tin-Coated Lead Foil Capsules for Wine Bottles, 57 Fed. Reg. 55485-87, 55489 (1992).

89. *See id.* at 55486-87.

90. *See* Lead in Ceramic Foodware; Revised Compliance Policy Guide, 57 Fed. Reg. 29734 (1992).

91. *See* 21 C.F.R. § 189.301 (1998).

92. *See* Tin-Coated Lead Foil Capsules for Wine Bottles, *supra* note 88, at 55489.

93. *See* PROP. 65 LITIGATION, *supra* note 56, at 10. Private parties attempted unsuccessfully to also prosecute claims alleging that exposure to in situ lead in wine violated Proposition 65. These actions were dismissed based on technical grounds. *See id.* at 9-10.

94. *See* Greg Lucas & Alex Bamum. *Winemakers Agree to Get the Lead Out*. S.F. CHRON., Dec. 7, 1991, at B1.

95. *See* Graziano & Blum, *supra* note 87.

96. *See id.*

97. *See* Bolger et al., *supra* note 80, at 59.

98. PROP. 65 LITIGATION, *supra* note 56, at 22-23.

99. *See* Book Statement, *supra* note 21, at 108.

100. The company said that they always were intended for decoration, but consumer representatives pointed out that the bottles could be fitted with ordinary nipples. *See* Pamela Warrick, *Signs Could Make Danger Crystal Clear*, L.A. TIMES, June 13, 1991, at E1.

101. 42 U.S.C. §§ 7401-7671q, ELR STAT. CAA §§ 101-618.

102. 40 C.F.R. § 50.12 (1998).

103. *See* U.S. EPA, TOXIC RELEASE INVENTORY (Mar. 9, 1999) http://www.epa.gov/enviro/index_java.html. The Emergency Planning Community Right-To-Know Act's (EPCRA's) figures considerably underestimate actual lead emissions, because they exclude facilities below EPCRA's high reporting thresholds (for chemicals used at a facility, the reporting threshold is using 10,000 pounds per year). *See* 42 U.S.C. § 11023(f)(1)(A), ELR STAT. EPCRA § 313(f)(1)(A).

104. *See* Michael Freund, *Proposition 65 Enforcement: Reducing Lead Emissions in California*, 10 TUL. ENVTL. L.J. 333, 345-59 (1997).

105. *See id.* at 345-46.

106. *See id.* at 355.

107. *See id.* at 345-59.

108. *See id.* at 335.

109. *See* U.S. EPA, TOXIC RELEASE INVENTORY, *supra* note 103.

110. *See id.*

111. The decline in air emissions for these chemicals in California was 73 percent, while the decline for the rest of the country was only 48 percent. *See* David Roe & William Pease, *Toxic Ignorance*, ENVTL. F., May/June 1998, at 24, 31-32.

112. *See id.*

113. *See* RICHARD P. MAAS ET AL., UNC-ASHEVILLE ENVIRONMENTAL QUALITY INSTITUTE, TECHNICAL REPORT 98-053, LEAD EXPOSURES FROM BRASS FIXTURES CONNECTED TO COMMERCIALLY AVAILABLE WATER FILTERS (1998).

114. *See id.; see also* Michael Green, *Lessons for the Water Treatment Industry: Filtration Study Finds Brass Components Leach Lead Into Drinking Water*, 21 WATER CONDITIONING & PURIFICATION 84 (1998).

115. *See* Green, *supra* note 114, at 84.

116. *See id.*

117. *See* ENVIRONMENTAL DEFENSE FUND, *supra* note 73.

118. The suit was filed after a 1997 study found that between 26 and 79 [mu]g of lead may be left on the hands of persons who apply lead-containing hair dyes, even after the hands are washed. *See Suit Alleges Excessive Lead in "Grecian Formula,"* S.F. RECORDER, Feb. 10, 1997, at 6.

119. *See* ENVIRONMENTAL DEFENSE FUND, HOME LEAD MELTING DRAWS NATIONAL WARNING AS PRODUCERS OBEY CALIFORNIA LAW (Dec. 16, 1996).

120. *Attorney General Announces Settlement Over Lead in Maalox*, CAL. ENVTL. INSIDER, July 30, 1999, at 12.

121. *See* PROP. 65 LITIGATION, *supra* note 56, at 28; *see also Historic Lead Paint Agreement in LA*, CAL. ENVTL, INSIDER, May 18, 1998, at 11.

122. This contrasts with the prospective, industrywide solutions that are possible with consumer products.

123. *See* CAL. HEALTH & SAFETY CODE § 25249.11(b) (West 1992 & Supp. 1999).

124. *See* 42 U.S.C. § 300g-6(c), ELR STAT. SDWA § 1417(c). The Residential Lead-Based Paint Hazard Reduction Act, 42 U.S.C. § 4852d(a) (commonly referred to as "Title X").

125. *See* Clifford Rechtschaffen, *The Lead Poisoning Challenge: An Approach for California and Other States*, 21 HARV. ENVTL. L. REV. 387 n.143 (1997).

126. 33 U.S.C. §§ 1251-1387, ELR STAT. FWPCA §§ 101-607.

127. 15 U.S.C. §§ 2601-2692, ELR STAT. TSCA §§ 2-412.

128. 42 U.S.C. §§ 6901-6992k, ELR STAT. RCRA §§ 1001-11012.

129. 21 U.S.C. §§ 321-3506, FFDCA §§ 201-412.

130. *See* PERCIVAL ET AL., *supra* note 12, at 183.

131. *See* 15 U.S.C. § 2605(a), ELR STAT. TSCA § 6(a).

132. In 1991, for instance, EPA proposed investigating whether to phase out lead in several products, including brass faucets, lead solder using for water pipes, and lead in nonresidential paint and more generally limit lead production. *See* Comprehensive Review of Lead in the Environment Under TSCA, 56 Fed. Reg. 22096 (1991). Three years later, EPA proposed requiring that significant new uses of several classes of products containing lead that could lead to human

exposure, including plumbing components, household products, products likely to be mouthed by children, and others first demonstrate that the uses did not pose unreasonable risks. *See* Significant New Uses of Lead, 59 Fed. Reg. 49484 (1994).

133. *See* 15 U.S.C. § 2605(a), (c), ELR STAT. TSCA § 6(a), (c).

134. *See* Corrosion Proof Fittings v. EPA, 947 F.2d 1201, 22 ELR 20304 (5th Cir. 1991).

135. *See* CAL. HEALTH & SAFETY CODE § 25249.5 (West 1992 & Supp. 1999).

136. *See* David Roe, *An Incentive-Conscious Approach to Toxic Chemical Controls*, 3 ECON. DEV. Q. 179, 180-81 (1989). This reverses the usual incentives to delay the setting of administrative standards.

137. *See* CAL. HEALTH & SAFETY CODE § 25249.7(c), (d).

138. *See id.* § 25249.10(c).

139. *See id.* § 25192.

140. *See* Clifford Rechtschaffen, *The Warning Game: Evaluating Warnings Under California's Proposition 65*, 23 ECOLOGY L.Q. 303, 343-44 (1996).

141. *See id.* at 341-44.

142. *See* Book statement, *supra* note 21. The OSHA standard actually provides that lead in the air in a workplace shall not exceed a concentration of 50 [mu]g per air per cubic meter of air, based on the time-weighted average concentration during an eight-hour work shift, 29 C.F.R. § 1910.1025 (1998). The Health and Welfare Agency assumed that because a worker breathes 10 cubic meters of air during a shift, and therefore could be exposed to 10 times 50, or 500 [mu]g of lead during a workday, 500 [mu]g effectively represented the NOEL.

143. *See* NATIONAL RESEARCH COUNCIL, MEASURING LEAD EXPOSURE IN INFANTS, CHILDREN, AND OTHER SENSITIVE POPULATIONS 67 (1993).

144. *See* 40 C.F.R. § 141.51(b) (1998).

145. *See supra* notes 66-67 and accompanying text.

146. *See* Rechtschaffen, *supra* note 140, at 344-47.

147. There are some exceptions, such as the SDWA's requirement that public drinking water systems notify customers of excessive lead levels, and 1992 legislation mandating that renters and purchasers of pre-1978 homes be informed about lead-based paint hazards. *See* Title X, *supra* note 124.
